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The credit to which the author is chiefly entitled is due to his admirable application of the positive method to geographical investigation. It was only by the introduction of the element of systematic coordination that he was able to muster the facts of human geography in their exact relations. Much remains to be added to his work but the book is bound to remain for a long time to come a most prolific source of suggestiveness and one which no geographer can afford to ignore. Therein its merit exceeds its value as a treatise on human geography.

The edition differs slightly on the whole from the first. In both, the clear vision of the geographical factor underlying natural manifestations on the surface of the earth is evoked. Whether the description given refers to one of man's special industries or to the spread of a disease, or of a race, the salient note is that of relation to locus on our planet's surface. In asserting that, when regarded from the standpoint of pure geography, there can exist no difference between a city avenue and a river or between a block of houses and a craggy pile of mountains, Brunhes has not merely confined himself to giving expression once more to the most modern conception of geography as a science. He has actually gone a step further and ascribed by the very same assertion the science's true place in the investigation of nature as a unit towards which all human study must ultimately converge after it has reached a certain stage of development.

The line of demarcation between ethnography and human geography is sharply laid out. The example thus given deserves being followed, as the tendency to include mere descriptions of customs under the heading of geography is not uncommon. LEON DOMINIAN.

The Sea Trader, His Friends and Enemies. By David Hannay. xi and 388 pp. Ills., index. Little, Brown & Co., Boston, 1912. $3.75. 9 x 6.

This history of the sea trade from its earliest recorded beginnings to the advent of large and well-equipped services is an intensely human story. The sea trader has been neglected for the more romantic tales of the discoverer, the privateersman or the pirate, but now it is possible to read of the evolution of shipping from the standpoint of world commerce. As a whole the book is new, and familiar stories of the sea have been omitted. When, however, the sea trader comes into contact with the dominant powers of the sea as the pirate, the angle of vision changes. The book has much of adventure in the opening of ocean routes in the various seas, considers cargoes and sailors and supplies a picture of the life of these sailors under the changing conditions. An impressive chapter on the slave trade stands out as a dark page of the sea trader's history.

ROBERT M. BROWN.

ECONOMIC AND COMMERCIAL GEOGRAPHY

Coal and What We Get from It. A Romance of Applied Science. By Raphael Meldola. 210 pp. Ills., index. Society for Promoting Christian Knowledge, London, 1905. 2s. 6d. 7 x 5.

The title is somewhat misleading, as a few pages only are devoted to the origin, geological relations and geographical distribution of coal. The book belongs in the field of chemical technology and is a semi-popular account of the various derivatives of coal tar. Among the products now common, whose derivation is treated, are the various dyes, including artificial indigo, coal-tar products used in pharmacy, saccharin, aromatic perfumes and substances used in photography. Each product is discussed chemically and historically as well. Notwithstanding the omission of chemical formulæ, the book is not easy reading for the non-chemist. It is not, therefore, a precise use of terms to call the volume a "romance of applied science." The title of the work is used as a running headline throughout, a plan which is as perplexing to the reader, as it is a needless waste of type and space. A. P. BRIGHAM.

OCEANOGRAPHY

Waves of the Sea and Other Water Waves. By Vaughan Cornish. 374 pp. Ills., index. T. Fisher Unwin, London, 1910. 10s. 9 x 6.

Every geologist should welcome this critical and fairly comprehensive treatment of the subject of water waves by the foremost authority upon wave action in connection with geological processes. The first part (138 pp.) is devoted to a critical discussion of the size of storm waves at sea based upon the author's own and other observations. It is found that measurements of wave height taken from ships and based upon the eye elevation at which the horizon is just eclipsed by the wave crest, if suitably corrected, correspond well with those determined from the period and velocity of the wave, though the latter method is on the whole the more reliable. The method of determining the period at sea when the ship's course is parallel to and in the same direction as the progression of the wave, is by noting both the time interval which separates the arrival of successive waves and, further, the time required for these to travel the known length of the ship. The fairly concordant results determined by various observers when properly corrected make the height of the large waves during ordinary strong gales on both the North Atlantic and North Pacific practically constant and "not less than 43 feet," though peaks of water due to cross seas may reach a height of 60 feet. In the extreme southern ocean, where land areas are not present to limit the fetch of the prevailing westerly winds, much higher values have been measured.

The measurement of the wave length is less simple, since this does not maintain a perfectly constant relation to wave height. Shortly after the strong wind has begun to blow, the waves are relatively steep and short, but after a sufficient time has elapsed their form becomes nearly constant with a wave length about fifteen times the wave height. For all save the southern oceanic areas this wave length is believed to vary but little from 600 feet in the case of heavy storms. Figures more than twice as great have, however, several times been noted by reliable observers in the extreme southern ocean.

To the waves of the sea which are of longer or shorter period than the "dominant" wave (and hence of longer or shorter wave length and of greater or of less height), Dr. Cornish has devoted less attention than would be desirable. The so-called *swell*, or the principal wave of higher order of magnitude, was studied especially through its breakers at Branksome Chine after the great mid-Atlantic storms of December, 1898. These swells were found to have a period of 19 seconds, which showed that in deep water they must have had a wave length about three times that of the dominant wave (1850 feet) and a velocity of progression of not less than 66.5 statute miles per hour—more than a mile per minute. In a case examined by Abercrombie the height of the swell was determined to be about one-half the height of the visible or dominant wave which the eye clearly perceives.

The waves of lower order superimposed upon the dominant ones, which, during a strong gale on the Atlantic, the reviewer has counted to at least five distinct orders in parallel series, Dr. Cornish has not treated in this work. While it is undoubtedly true, as he observes, that these waves of lower order are not fitted to travel far after subsidence of the wind, they are none the less extremely instructive in revealing the nature of the counteraction of the waves upon the air currents to produce eddies and minor undulations within the lower strata. While perhaps not so important over the sea, such motions become of extreme importance in connection with sand-blast etching of rock in desert regions.

In his study of "The Action of Sea Waves to Transport Shingle, Sand and Mud," Dr. Cornish brings out the important fact that the normal depth of the edge of the continental shelf (600 feet) is so determined because storm waves with wave length of 600 feet are effective in transporting rock particles down to this depth from the surface, a fact which the reviewer has elsewhere emphasized. The correspondence is in reality even more striking than Cornish assumes, for about the Antarctic continent where wave lengths more than twice the "normal" have a number of times been measured, the depth of the continental shelf margin is likewise more than double the usual figure of 600 feet. The valuable expression *wave base*—the base of effective transportation of rock debris at a depth one storm-wave length below the surface—he does not, however, employ.

The treatment of the movement of shingle by storm waves is on the whole the least satisfactory portion of the work, and, while the observations are of interest, the conclusions are the less reliable because too little attention has been given to studies by other and especially by non-British students of the subject.

No mention is made, for example, of the classical studies by Gilbert upon shore action. The contention of Dr. Cornish that pebbles along the shore are reduced in size mainly through fracture, and not by attrition, must meet the objection that shingle beds reveal few fractures and almost uniformly present watch-shaped individuals; as it must also meet the known fact that pebbles are lifted but slightly in their movements and cushioned by the water during impact.

The work is concluded by interesting chapters upon the waves of rivers, including bores, curious results of the meeting of waves from different directions, etc. The forty-nine plates which adorn the work are of interest, and, like the letter press, they are a credit to the publisher.

WILLIAM HERBERT HOBBS.

The name of Vaughan Cornish has been identified for many years with the study of waves. In geographical sciences he is the specialist on this subject. His book is therefore full of personal observations. Cornish did not gather the facts as they came. He has crossed the oceans many times in order to observe himself all the particulars of the stormy sea, he has spent weeks and months at seashores, at Niagara and other water falls, at rivers, canals and lakes, always observing, always thinking of one thing: the waves.

Cornish has the critical mind of a well-trained scientific man, he has the enthusiasm of a lover of nature and he never leaves the ground of observed facts in favor of logical reasonings leading to sensational theoretical generalizations. In order to verify his reasonings he prefers to consult nature.

The present book consists of three parts: in the first Cornish studies the size and speed of deep-sea waves; in the second he treats the subject of the action of sea waves to transport shingle, sand and mud, and in the third he gives a good deal of information on stationary and progressive waves in rivers. The illustrations are excellent, the style is good and the book is pleasurable reading. Tourists crossing the ocean will be benefited by reading this instructive guide. The book ought to be in every library on transatlantic steamers.

HENRYK ARCTOWSKI.

MATHEMATICAL GEOGRAPHY AND CARTOGRAPHY.

Plane Surveying. Text and reference book for the use of students in engineering and for engineers generally. By Paul C. Nugent. 3d edition, revised. xxii and 599 pp. Diagrams, index. John Wiley & Sons, New York, 1911. 9 x 6.

Topographic, Trigonometric and Geodetic Surveying, including geographic exploratory and military mapping. With hints on camping, emergency surgery and photography. By Herbert M. Wilson. 3d edition. xxx and 912 pp. Maps, ills., index. John Wiley & Sons, New York, 1912. $3.50. 9 x 6.

New astronomical tables, extending through 1928, have been added to the last edition of the first of these two books. Another innovation consists in the replacing of Appendix C on the "Restoration of Lost or Obliterated Corners" by the latest revision of the circular on this subject issued by the U. S. General Land Office, which refers to the entire subject of resurveys.

The third edition of the second book differs little from the previous two issues. A few minor changes and corrections occur occasionally.

Both works still retain their high rank among similar publications in the United States. Although the first is avowedly destined for the use of students in engineering, or for engineers alone, it may well find a useful place in a geographer's library. The study of the subject-matter of the second being part of a geographer's training, it is not amiss to state that familiarity with its contents is indispensable to followers of this science. Topographers, geodesists and cartographers will find in it practically all the information needed for their work.

LEON DOMINIAN.

Determination of Time, Longitude, Latitude and Azimuth. By William Bowie. 5th edition. 177 pp. Ills., index. *U. S. Coast and Geod. Surv. Special Public No. 14.* Washington, 1913.